

Sea Level Rise (SLR) Projection

Science and Technical Subcommittee

Presented by:

Pat Gleason, Ph.D., P.G.

Chair, Science and Technical Subcommittee

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Science and Technical Subcommittee

NAME

ORGANIZATION

Patrick Gleason, Ph.D.

CDM

Colin Hughes, Ph.D.

FAU

Robert Renken

USGS

Rohit Goswami

Geosyntec

Barry Heimlich

WAB

Heike Lueger, Ph.D.

Carbon Solutions America

Jon Brewer

Carbon Solutions America

Hector Samario

FPL

Elizabeth Quinn

CDM

Stewart Magenheimer

CDM

Ruth E. Burney

CDM

Audra McCafferty

McCafferty Brinson Consulting, LLC

Greg Phillips

Participating County Staff

Nancy Craig, Ph.D.

BC - EPGMD - PPRAQD

John Pipoly, Ph.D.

BC - Parks - Extension

Michael Zygnerski

BC - EPGMD-NRPMD - WRP

Nancy Gassman, Ph.D,

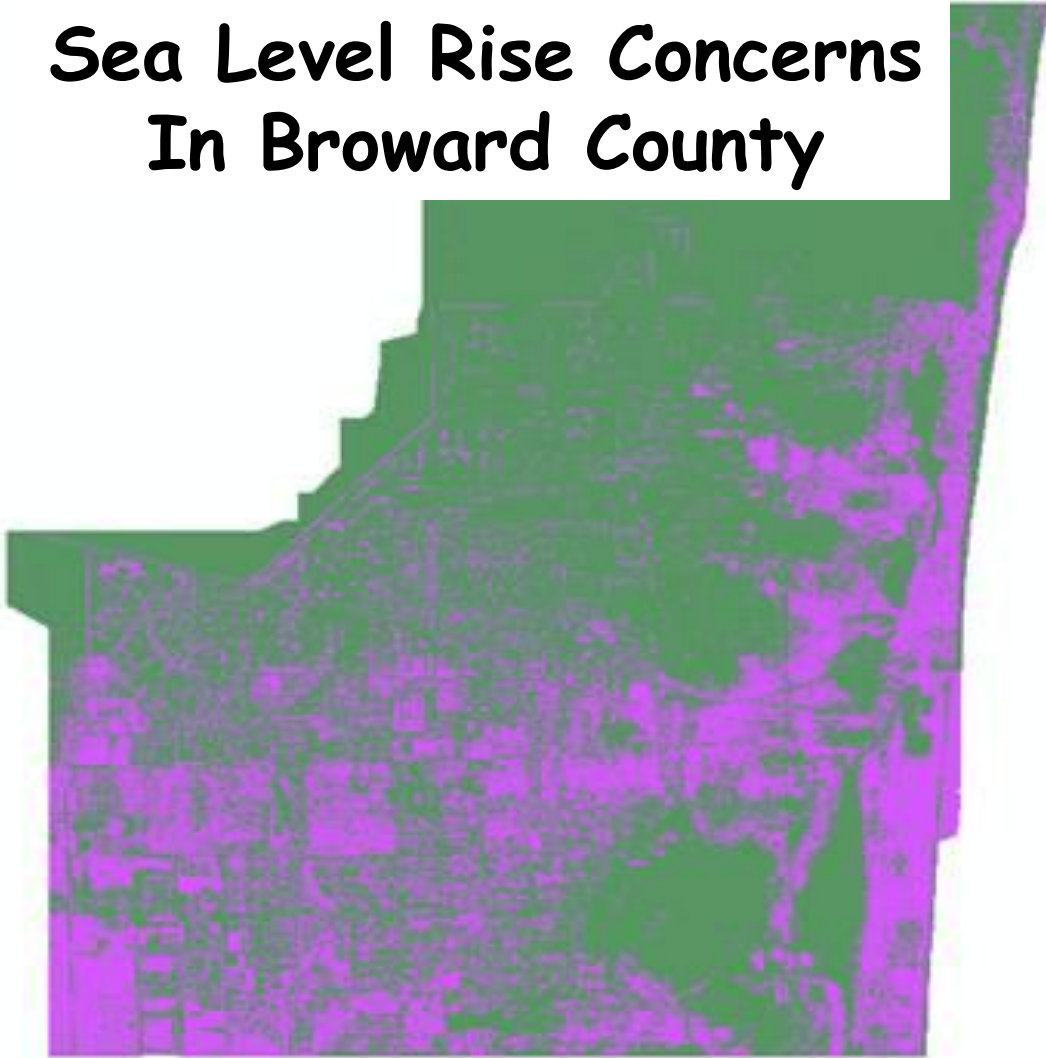
BC - EPGMD -NRPMD

Don Burgess

BC - EPGMD -NRPMD



Sea Level Rise Concerns In Broward County



Broward County Elevation Map. This is LiDAR elevation data from 2008. Elevations less than 5 feet above sea level are shown in purple.

- Currently, 602,325 residents live within 5 miles of the coast.
- Almost 29% of Broward County is less than 5 feet above sea level.

Impacts

- Inundation and shoreline recession;
- Increased flooding from severe weather events;
- Saltwater contamination of groundwater; and
- Elevation of the water table.

Factors Affecting Sea Level Change

A. Components of Change

- a. Water-related
 - i. Thermal Expansion of sea water
 - ii. Volume increase via
 - a. ice sheet melting and
 - b. land water storage change e.g. glaciers
- b. Land-related
 - i. Erosion
 - ii. Land subsidence and uplift
 - iii. Glacial rebound
 - iv. Tectonics
 - v. Volcanics



Factors Affecting Sea Level Change

A. Components of Change (cont)

c. Earth-related

a. Albedo - how well a surface reflects solar energy

b. Gravity*

c. Rotational effects*

*Result in non-uniform distribution of sea-level rise



Estimate of Sea Level Rise Based on Tide Gauge Records

Location	Data Source	Time Frame of Data Collection	Average Rate (mm/yr)	Rise in inches per century
Global	Tide gauge	1900-2000	1.7	6.7
Global	Tide gauge	1961-2003	1.8	7.1
Global	Altimetry	1993-2008	3.1	12.2
Atlantic Coast	Tide gauge	1900-1999	3	11.8
Gulf Coast	Tide gauge	1900-1999	6	23.6
Miami Beach	Tide gauge	1931-1999	2.4	9.4
Key West	Tide gauge	1913-1999	2.3	9.1

Current Sea Level Rise Rates (Projected)

- Models are approximations of the real world
- Assumptions -some projections assume all conditions are static
 - SLR rate does not change
 - No increase in greenhouse gas production
 - No change in glacial melt rate
- Conditions are dynamic -(IPCC scenarios) use trend data



SLR Projection Concerns

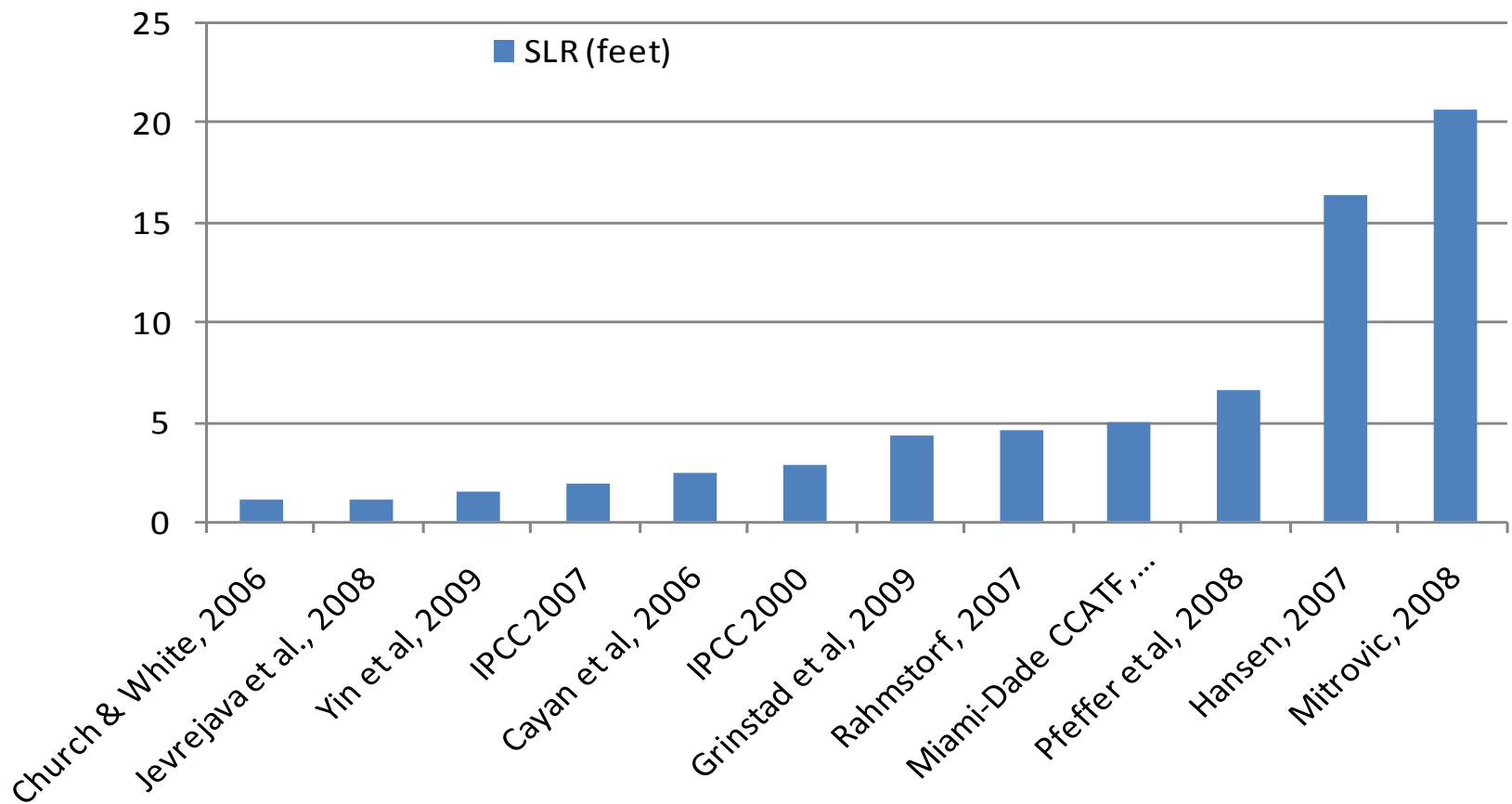
Models are extremely complex - how do they consider:

1. Greater pace of ice melting than previously predicted
2. Environmental feedback mechanisms
3. Eustatic vs local changes in SLR
4. Reversals within generational time-scales



Range of Projections for 2100

Upper Range of Sea Level Rise Projections for 2100



Sea Level Rise 21st Century Projections

Prepared by Barry N. Heimlich, 9/8/08
from published articles and reports

Likely Maximum Rise
*Pfeffer, *Science*, Sept 2008

1.0 meters
(Rahmstorf, 2007)

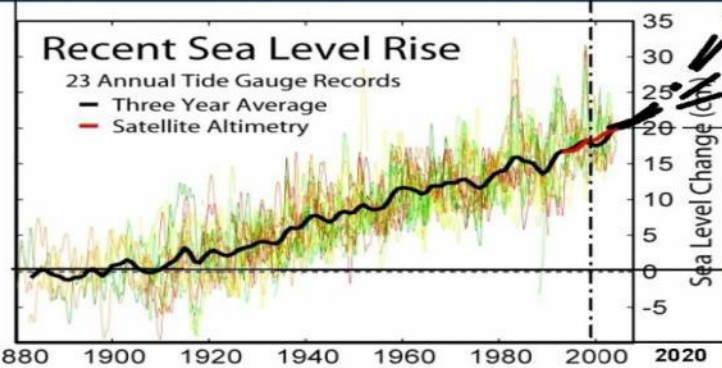
0.9-1.3 meters
(Grinsted et al,
2009)

0.8-1.3 meters
(Pfeffer et al, 2008)

0.34 meters
(Jevrejava et al., 2008)

Recent Sea Level Rise

23 Annual Tide Gauge Records
— Three Year Average
— Satellite Altimetry



Above Current
Sea Level, meter ft

*Pfeffer, W.T., J.T. Harper, and S.O'Neel. 2008. Kinematic Constraints on Glacier Contributions to 21st-Century Sea-Level Rise. *Science*. 321:1340-1343.
Grinsted et al, 2009) Reconstructing sea level from paleo and projected temperatures 200 to 2100 A.D. *Clim. Dyn.*
Jevrejava et al., 2008. Recent global sea level acceleration started over 200 years ago. *Geophys. Res. Letts*. 35:L08715.

Existing Recommendations

Miami-Dade CCATF

Science and Technical Committee

Jan 2008

1. 2050 1.5 feet (0.45 meters) SLR
2. 2100 3-5 feet (1-1.5 meters) SLR
3. Model SLR scenarios by one foot intervals up to 5 feet - LiDAR



Recommendations - 2030

Assumptions for 2030 Sea Level Projection

If the current rate of rise (2.4 mm/yr) in S. Fl. persists, the increase in sea level since 2000 will be 2.8 inches.

Given:

- Rapidly changing global conditions;
- Newly published projections for 2100 > IPCC 2007; and
- 20th century local SLR rate ~ 1.4X the global rate,
- The IPCC 2007 high projection value for 2030 was multiplied by 1.4 to estimate local rates of sea level rise from global projections.

Planning Range for 2030
3 -9 inches



Recommendations - 2100

Assumptions for 2100 Sea Level Projection

Given:

- Substantial scientific debate occurring among the field of experts;
- New climate science published daily suggesting acceleration of climate change impacts; and
- The general scientific consensus that the IPCC high value (23 inches) is too low but has not agreed on a new projection,
- The Science and Technical Subcommittee has not currently developed a recommendation for a long term projection - await more scientific consensus.

Planning Range for 2100

A value greater than IPCC 2007

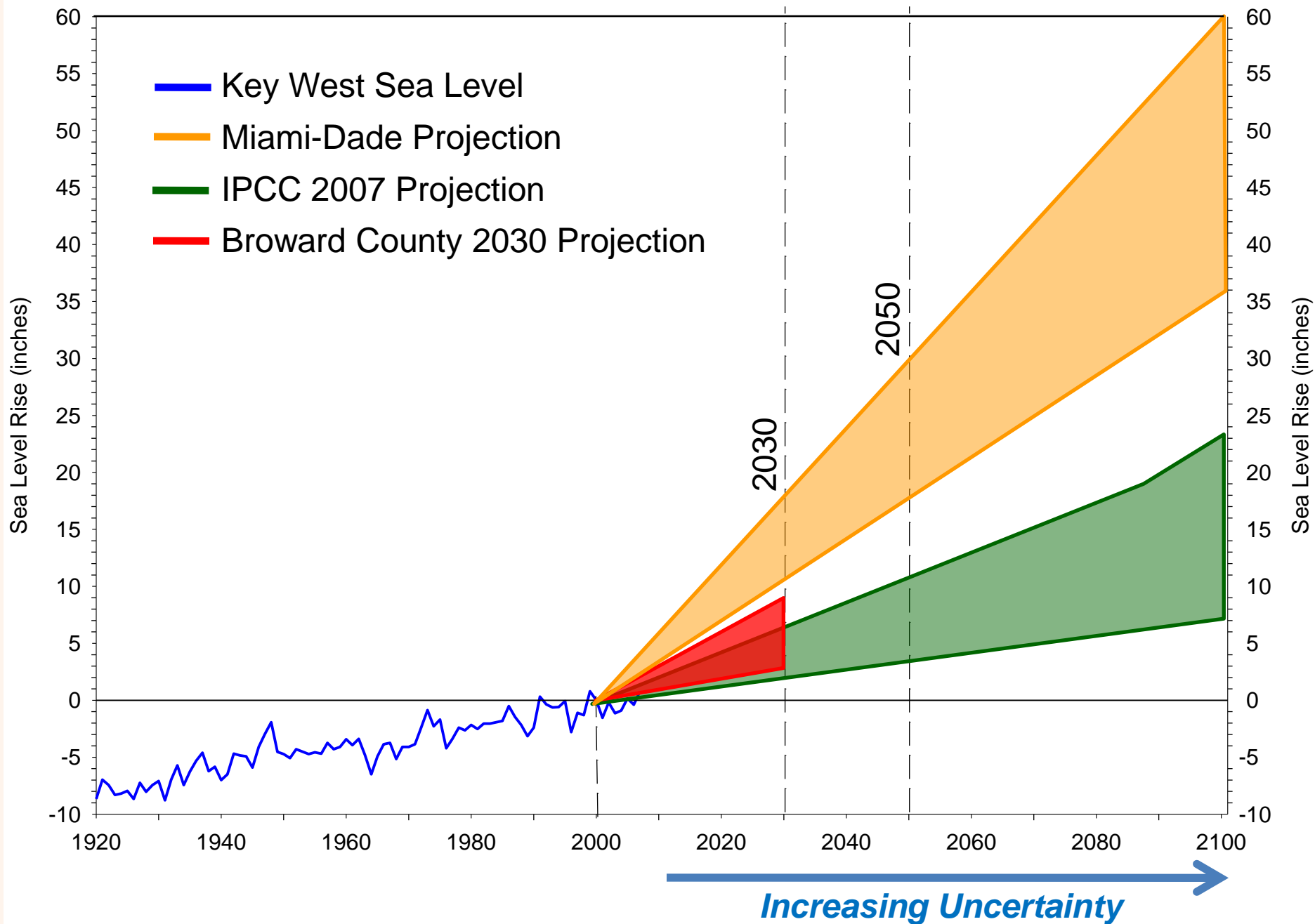
Scientific Consensus

- The International Science Congress on Climate Change met in March, 09 to develop a scientific consensus to be published in June, 09 in anticipation of the United Nations Climate Change Conference to be held in December, 09 in Copenhagen.
- International Panel on Climate Change will begin meeting in July to lay out the next IPCC report due out in 2014

Future Consensus Projections

International Science Congress on Climate Change
- June, 2009

The International Panel on Climate Change
-2014



Conclusions

- Scientific evidence suggests the potential for accelerating rates of SLR in the future.
- Sea level rise projections become more uncertain the farther into the future you project.
- Climate Change Task Force should use 3-9 inches of sea level rise by 2030 for planning purposes.
- New research and data are being developed daily.
- Science and Technical Subcommittee will revisit the issue of sea level rise in 2100 in the near future.